



Arvind Gupta

# Quick Activities

Science and Craft



SCHOLASTIC

## QUICK ACTIVITIES

### Science and Craft

Arvind Gupta has written a dozen books on science activities, translated over eighty books in Hindi and presented ninety-six films on science activities. His first book *Matchstick Models & Other Science Experiments* has been translated into twelve Indian languages. He has also written *Odds and Ends* (Scholastic) and *Thumbprints* (Scholastic). He has received several honours, including the inaugural National Award for Science Popularisation amongst Children (1988). At present, he is working in Pune, at the Inter-university Centre for Astronomy & Astrophysics Children's Science Centre.

## QUICK ACTIVITIES

### Science and Craft

**Arvind Gupta**

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# Jumping Frog

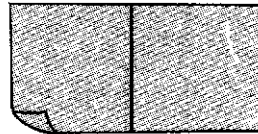
This is an amazing paper toy. It needs a special size of rectangular paper where the length is double the width. The frog has a special spring folded from the paper itself. When you press the spring, it makes the frog leap and jump.

## You will need

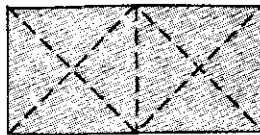
- a 10 cm x 20 cm sheet of paper

## Here we go

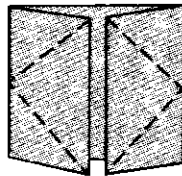
1. Take a 10 cm x 20 cm rectangular sheet of paper. Fold two squares in it.



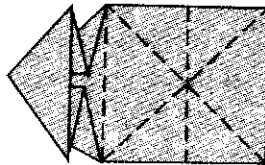
2. Fold criss-cross diagonals in both the squares. All the four creases should be in the same direction.



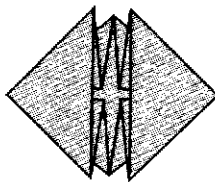
3. Reverse the paper. It will look like two hillocks. Fold the edges of the hills to the midline.



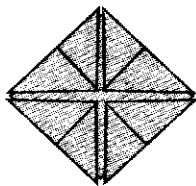
4. Reverse the paper. Tap the centres of both squares to get two cups. Push to make a triangle.



5. Repeat the same for the right side.

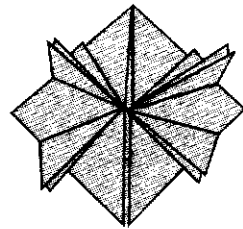


6. Bring all the four standing triangular ears to the left and right hand side corners and crease.

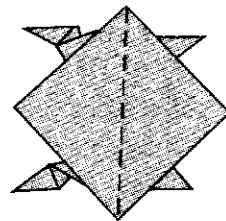


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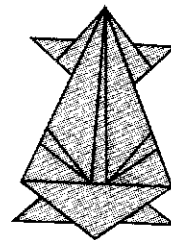
7. Bisect the internal angles to make the legs jut out.



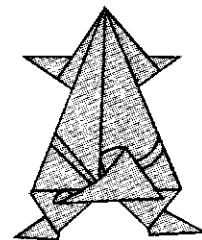
8. The model when reversed looks like a tortoise. Crease its backbone.



9. Crease the left and right hand edges of the diamond shape to the backbone.

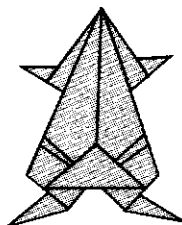


10. Fold the base triangle upwards, and insert the left flap in the pocket of the triangle to make a lock.

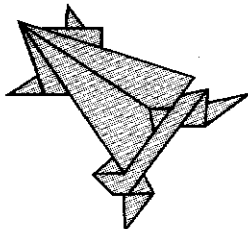


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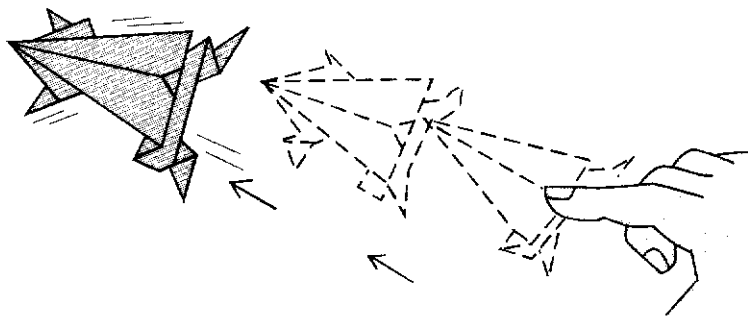
11. Similarly, lock the right flap.



12. Make a Z shaped spring by first folding the frog backwards and then forwards.



13. Press the spring to make the frog jump and leap.



## Flapping Bird

Children in Japan have been making this flapping bird for over three hundred years. You do not require scissors or glue to make it. You just need a paper square and your fingers.

### You will need

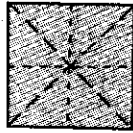
- a 10 cm x 20 cm sheet of paper

### Here we go

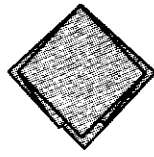
1. Start with a square bit of paper. Fold a criss-cross and then turn it over. You will find a hillock.



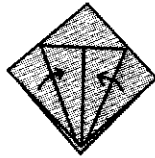
2. Fold a plus sign in the opposite direction.



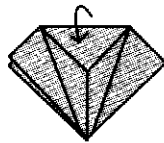
3. Fold to make a bud—a quarter square following the creases.



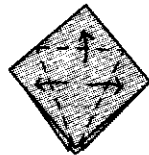
4. Fold the left and right flaps so they meet at the vertical centre line.



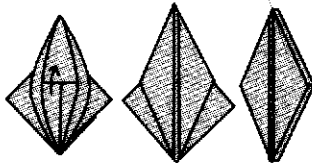
5. Fold the top triangle to make a cobra head.



6. Lift one layer to the base of the top triangle to fold a diamond.

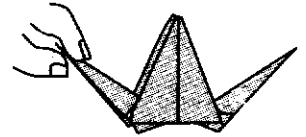


7. Similarly make another diamond on the reverse. This is the bird-base.

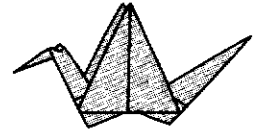


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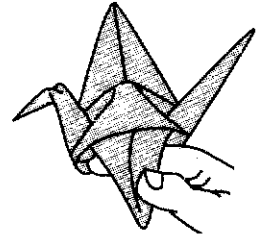
8. Lift the cut portions between the two wings.



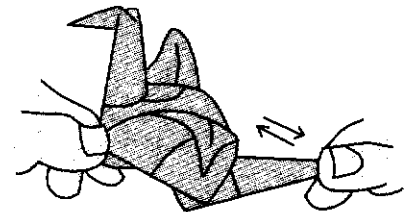
9. Fold a beak on the neck.



10. Gently curve the wings downwards.



11. Hold the bottom of the bird's neck with one hand and pull its tail repeatedly with the other. Its wings will flap.



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# Matchbox Rider

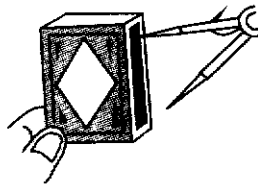
All it takes to make this matchbox train is an old cardboard matchbox and some thread. This toy is based on friction. As you move your hand, the toy matchbox moves on the thread rail track.

## You will need

- an empty matchbox
- a needle
- a 1.5 metre long string

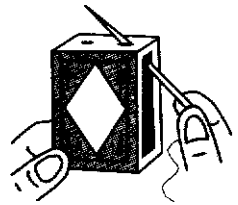
## Here we go

1. Make four holes on the matchbox—two on the drawer and two on the strike surfaces.

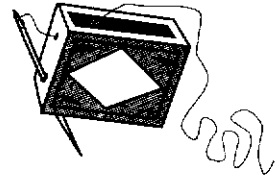


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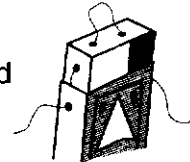
2. Take a needle with a 1.5 metre long string. Poke the needle from the side surface hole into the drawer hole.



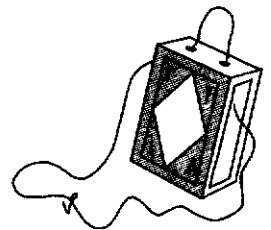
3. Thread the needle, as shown, through the other holes too.



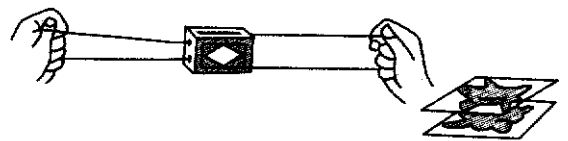
4. This is the threaded matchbox.



5. Now tie the two ends of the thread together to complete the mechanism.



6. Hold the string in both hands. Turn and twist the left hand. The matchbox will travel on the string track towards your left hand.



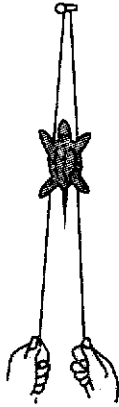
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7. You can stick the picture of a rabbit on the matchbox and enjoy the rabbit hop at your fingertips. The mechanism moves only in one direction so you will have to bring it back once it reaches the left-hand end.



8. Hang the left string loop of the mechanism by a nail and stick a cut-out of a lizard on it. On pulling the left and right strings alternately, the lizard will slowly climb up.



## Paper Patterns

To make these cut-out repeat patterns, all you need are some paper squares (newspapers will do) and a pair of scissors.

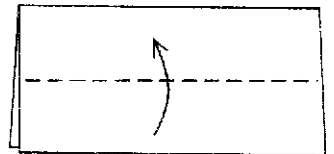
You can use these paper patterns to decorate your room and many other things.

### You will need

- square pieces of paper
- scissors

### Here we go

1. First fold the paper in half. Then fold the top layer of the bottom edge upto the folded edge. Turn over and repeat.



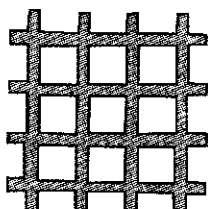
2. Fold the right edge to the left edge.



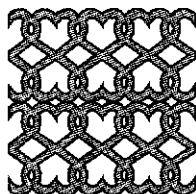
3. Fold the top layer of the left edge to the folded edge. Turn it over and repeat. This gives you a little square of paper with sixteen layers. By cutting into this shape and unfolding, you can discover many interesting patterns.



4. Simply cutting away each corner of the little square, for example, will create a grill-like pattern.



5. By cutting these two curves, you will achieve a more complex pattern.



6. Experiment in this way and when you find a pattern which you like, make several such patterns. You can stick them together to decorate the cover of a book or perhaps to decorate a wall. You can make lovely greeting cards by sticking the cut-out of one colour on a background card sheet of a different colour.

## Paper Cracker

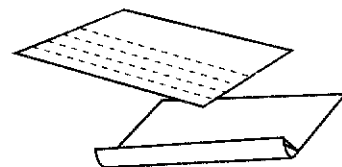
A paper cracker is easy to make and lots of fun to play with. If you don't like smoky and firey crackers, you will love a paper cracker.

### You will need

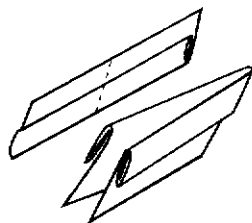
- a 20 cm x 30 cm sheet of paper.

### Here we go

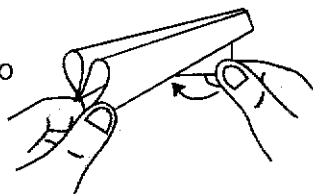
1. Take a 20 cm x 30 cm sheet of rectangular paper. Mark out six equal sectors along the width of the paper. Keep folding the sectors until just two remain.



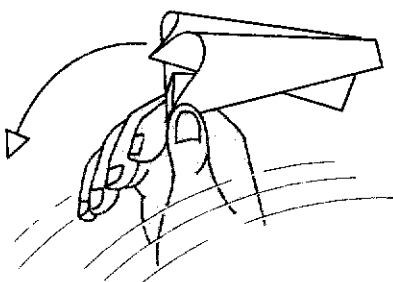
- Crease the model in half so that the folds are exposed.



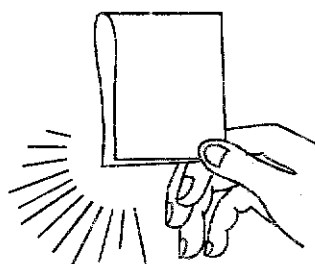
- Push the bottom right hand corner inwards to form two cones.



- Hold the lower left corner with your thumb and index finger and jerk the cones quickly into the air.



- You will hear a loud 'BANG' and the cones will disappear.



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## Sail Car

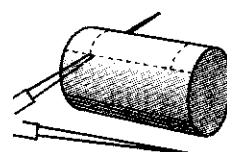
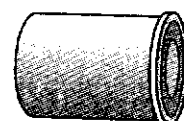
The awesome power of wind is being increasingly used in our country to produce electricity. This little sail car also demonstrates the power of the wind. The breeze from the ceiling fan is enough to make the car run.

### You will need

- a film-roll case
- 4 buttons with plastic jutting out in the middle
- 2 five centimetre long needles
- a ballpen refill
- a postcard
- a thin string

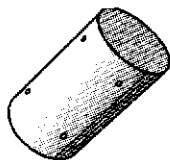
### Here we go

- First, mark out a rectangle (3.5 cm x 2 cm) on a film-roll case. Then make four holes with a divider point.

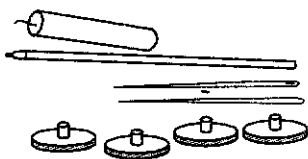


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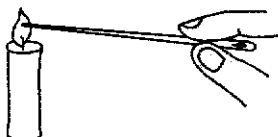
2. The four holes for the two axles are shown.



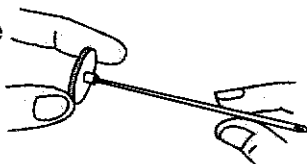
3. For making the wheels you need four buttons made of cheap plastic. These buttons have a protruding plastic pip in the middle.



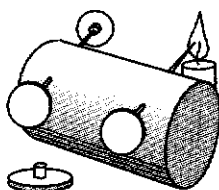
4. Take a 5 cm long needle and heat its tip.



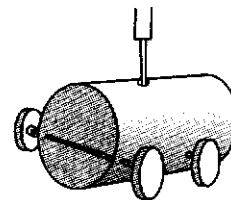
5. Insert the needle tip in the central pip of the button. The hot needle melts the plastic and goes in.



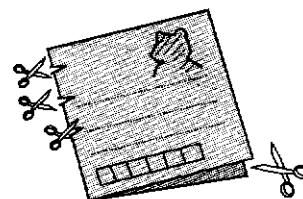
6. Fit these one-wheel axles into the holes of the film-roll case. Now heat the other tip of the needle and fix the second wheels.



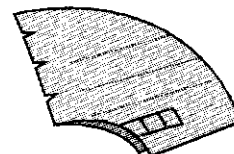
7. Make a vertical hole through the upper centre of the car. The hole should be big enough to accommodate a ballpen refill into it.



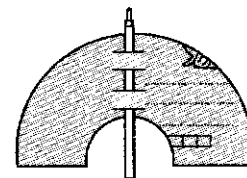
8. Double-fold a postcard and mark the two arcs and slits as shown.

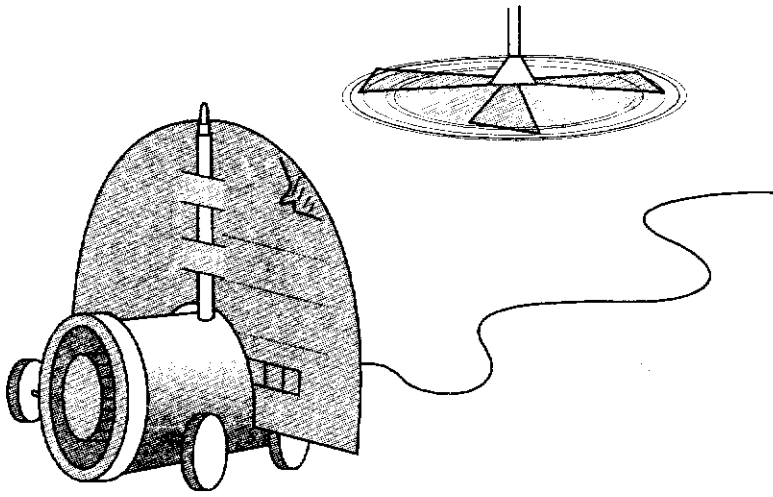


9. Cut the two arcs and the slits.



10. Now weave the ballpen refill through the slits in the postcard. Fix the refill along with the postcard sail in the car.





11. Replace the cap of the case. You can tie a thin string to the car and keep it on a smooth floor under the ceiling fan. The breeze will propel the car.

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## Musical Balloon

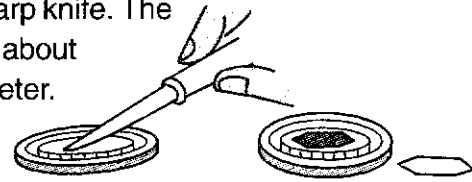
This musical instrument, which produces melodious notes, reminds one of the snake charmer's musical instrument—the *been*.

### You will need

- a film-roll case
- an empty ballpen refill
- some ordinary tools
- a sketch pen
- a torn balloon
- a sharp knife

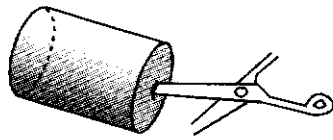
### Here we go

1. Cut the middle portion of the cap of the film-roll case with a sharp knife. The hole should be about 1.5 cm in diameter. Its shape is not important.

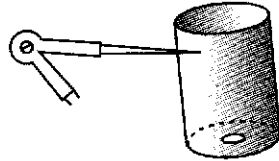


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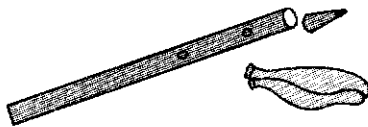
3. Make a hole in the middle of the base of the case. Be sure to widen this hole. The hole should be just large enough to squeeze a sketch pen through it.



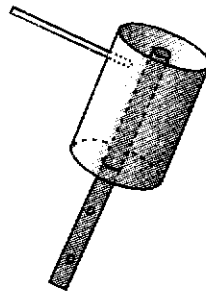
4. Make a small hole on the cylindrical surface of the case, about 1 cm from the open end. This hole should be just big enough for a ballpen refill to fit into it.



5. Take the sketch pen and snip off its pointed end. Make two small holes at a distance of 1 cm and 3 cm from this end. Slit a balloon as shown.

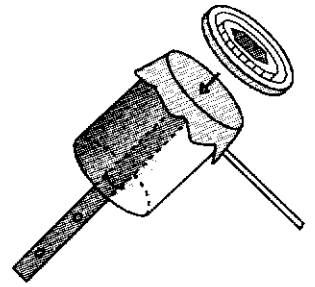


6. Press fit the sketch pen and ballpen refill in the film-roll case.

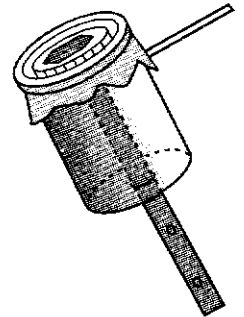


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7. Stretch the balloon on the mouth of the case. Replace the cap on the case to keep the stretched balloon in place.



8. The complete assembly of the musical instrument is shown here.



9. Now gently slide the sketch pen upwards so that it just touches the stretched balloon. Simultaneously, blow through the refill. At one particular position of the sketch pen, you will hear a clear and loud musical note. Fix the sketch pen in this position and keep blowing. By opening and closing the holes, as in the case of a flute, you can play a few notes. The balloon acts like a stretched membrane or diaphragm and begins to vibrate when you blow in. The plastic case acts like a sound box.

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# Tumbling Capsule

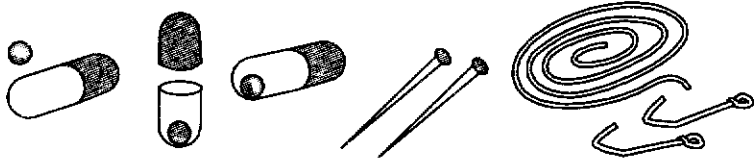
Tumbling capsules are fun to watch. Creating them is also a fun activity and requires just some time.

## You will need

- empty medicine capsules
- a ball bearing
- wires
- a long card paper strip
- nails

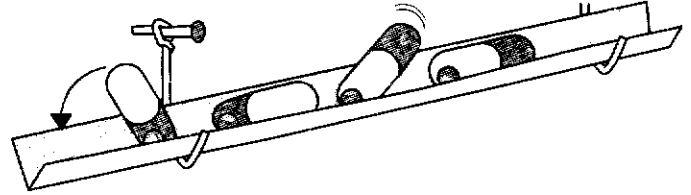
## Here we go

1. Take some empty medicine capsules or else use old capsules; slide open their two halves and empty out the contents. Place a ball bearing in one half of a capsule and then close its lid.

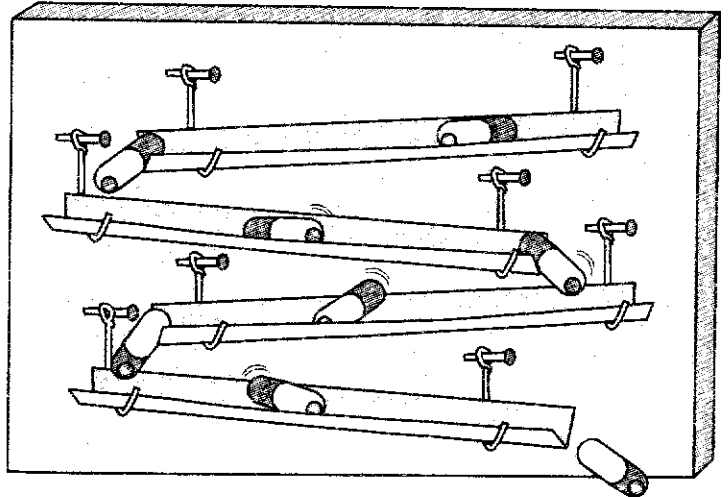


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2. Fold a long card strip in the middle to form a V shaped channel. Place the capsule in the channel. On tilting the channel, the capsule somersaults and rolls from the higher to the lower level.



3. Use wire hooks to affix several V shaped channels on a vertical soft board. The slopes of the channels should be just enough to make the capsule roll. On placing the capsule on the high end of the top channel, it rolls down into the second, then the third and finally down the fourth.



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# Paper Ball

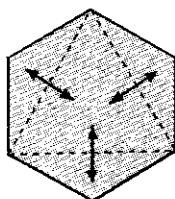
You can make a paper ball very easily. For playing inside the house, a paper ball is a good option.

## You will need

- 20 hexagonal pieces of paper
- glue

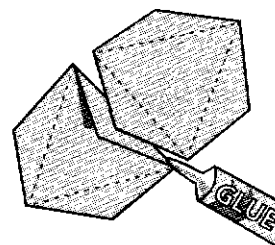
## Here we go

1. Take one hexagon and fold alternate corners to the centre. Make firm creases, then let the little triangular flaps so formed stand at right angles to the main area. Do the same with four more pieces.

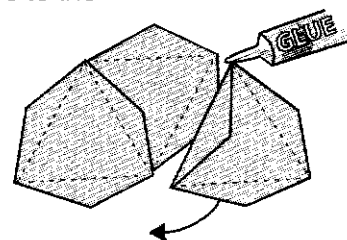


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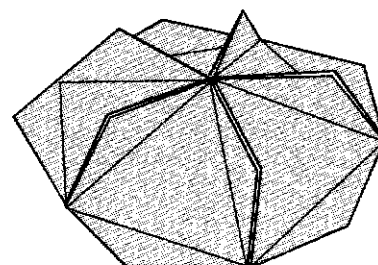
2. Join two pieces by gluing the outer sides of two flaps together.



3. Similarly glue a third piece to the first two. Add two more pieces (follow the direction of the arrow in the diagram) with the fifth piece glued also to the first piece.



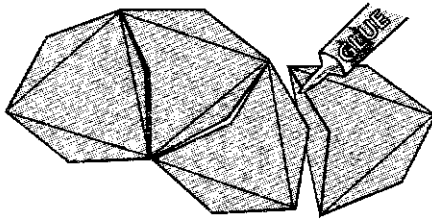
4. You will now have a standing structure which has five triangular sides with little flaps in between.



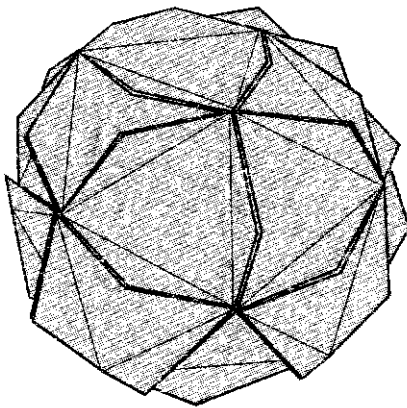
31



5. Now make a chain by gluing the remaining ten hexagons together in line. Note that the first three pieces are joined as shown in step 3 but the fourth piece is differently placed. Glue the two ends of the chain together. Then glue the top and bottom sections in place.



6. The completed twenty-piece ball is ready.



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## Newton's Disc

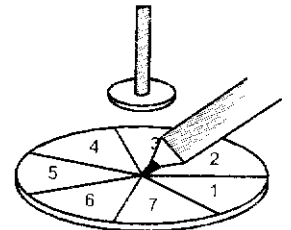
A Newton's disc is not only an entertaining toy, it also shows you how optical illusions work.

### You will need

- a circular cardboard disc
- an empty ballpen refill
- a rubber washer
- a piece of paper with rainbow colours on it

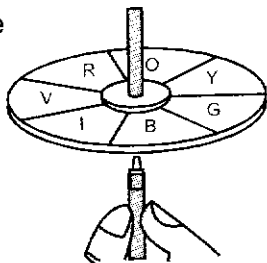
### Here we go

1. Cut a circular disc of diameter 6 cm from a tetrapack. Insert an empty ballpen refill in a rubber washer.

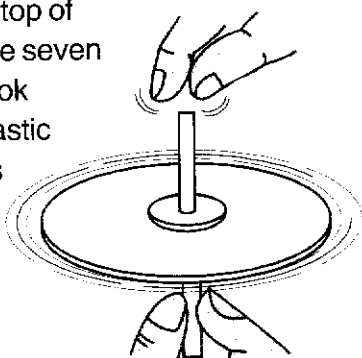


33

2. Fix the rubber washer in the centre of the disc. Stick a piece of paper with the seven colours of the spectrum—VIBGYOR, painted on this disc. Pivot the disc on the brass tip of an ordinary ballpen refill.



3. Spin the disc with the top of the refill and see all the seven colours combine to look grayish-white. The plastic refill, on its own brass tip, makes for a very smooth bearing.



## Dancing Doll

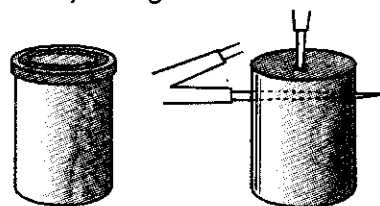
When you turn the handle of this toy, the dancing doll goes round and round.

### You will need

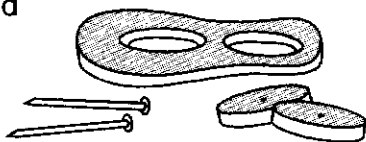
- a film-roll case
- 2 circular rubber discs
- a ballpen refill
- scissors
- 16 steel pins

### Here we go

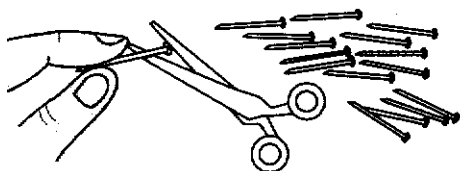
1. Take a film-roll case and make a hole in its base. This hole should be just big enough to press fit a plastic refill. Also make a horizontal hole in the case, 1.5 cm from the base.



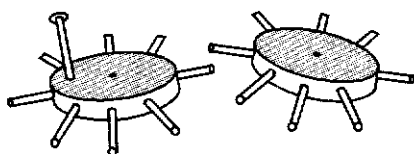
2. Cut two circular or octagonal discs, 3 cm in diameter, from an old slipper. Make a hole in the centre of each disc.



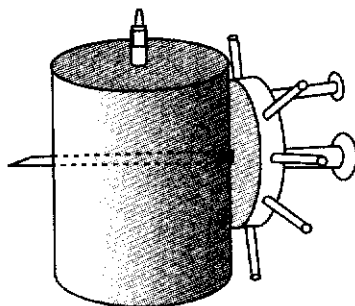
3. Snip off the heads of 16 steel pins with scissors.



4. Fix eight pins equidistantly on the rim of each disc. Fix a nail for the handle near the edge of one disc.



5. Attach a ballpen refill to the base of the case. Pass a nail through the centre of the disc with the handle. Pass this nail through the holes in the case.

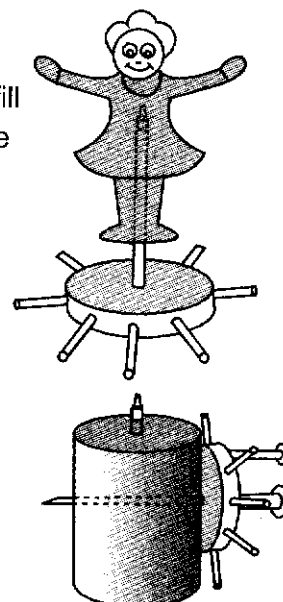


36

6. Cut a doll from a doubled-up card sheet and stick a refill through it. Fix this refill into the centre of the other rubber disc.

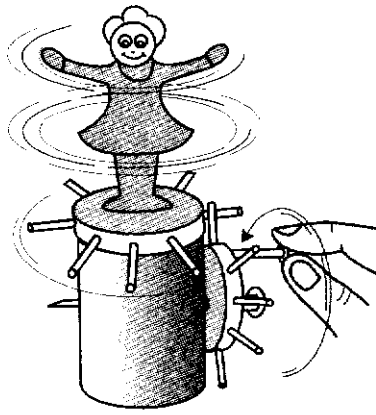


7. Place this doll-disc assembly on the refill attached to the base of the case.



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8. On rotating the handle, the vertical gear rotates. The pins of this vertical gear mesh with the pins of the horizontal gear, making the dancing doll go round and round. The driver gear moves in the vertical plane, whereas the driven gear moves in the horizontal plane.

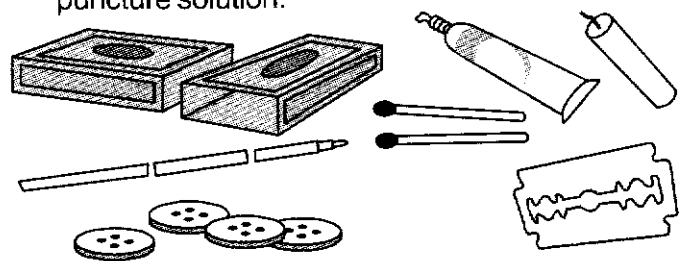


## Matchbox Tipper Truck

You must have seen tipper trucks unloading sand, stones or coal. You can readily make a working model of a tipper truck—incorporating several simple elements of machines like lever, fulcrum and wheels.

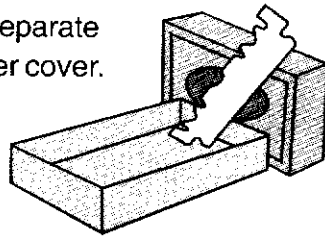
### You will need

- 2 empty matchboxes
- a ballpen refill
- 4 buttons
- matchsticks
- some rubber adhesive like Fevibond or cycle puncture solution.
- 2 long needles
- an eraser
- a candle
- a blade

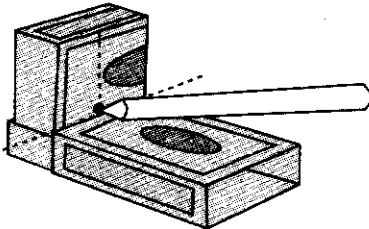


## Here we go

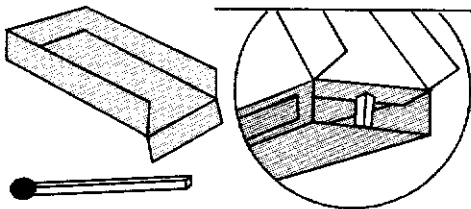
1. Take a matchbox and separate its drawer from the outer cover. Cut the outer cover so that it fits into the drawer. The cut cover becomes the driver's cabin.



2. Make a hole in the driver's cabin. Slip another matchbox cover on the drawer. This will be the *body* of the tipper.

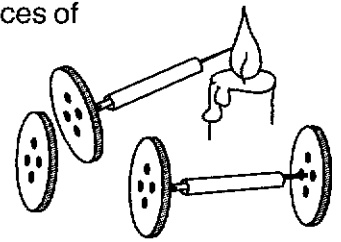


3. Take another drawer. Cut and bend its flap into the body of the truck. You can either stick this flap inside this body, or else you can wedge it with a piece of matchstick. This swivelling drawer makes the loading platform of the dumper truck.

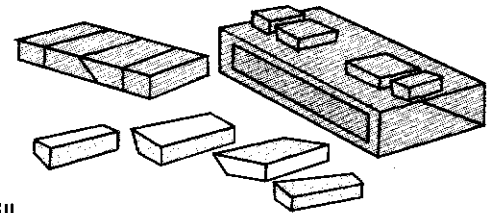


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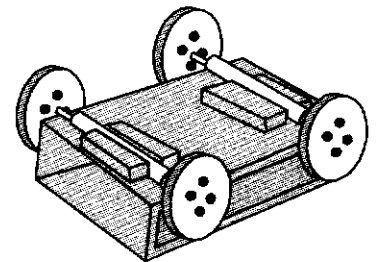
4. Make two pairs of wheels using buttons, 2 cm long pieces of ballpen refills as bearings and long needles as axles. You need buttons which melt with a hot needle.



5. Cut a rubber eraser into 4 pieces. Stick these pieces in two pairs below the body. The distance between each pair should be equal to the thickness of a ballpen refill.

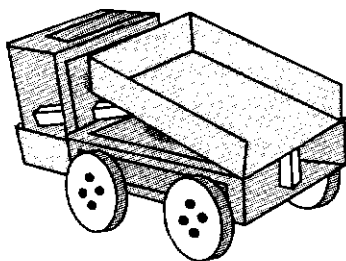


6. Insert the two pairs of wheels between the rubber pieces.



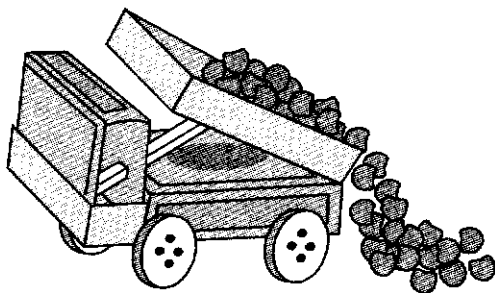
41

7. Insert a matchstick from the hole in the driver's cabin. The matchstick will act like a lever.



8. Load some pebbles as cargo in the truck. On pressing the matchstick lever from inside the driver's cabin, the loading platform will be raised to unload the cargo.

The tipper truck will run very smoothly on being pushed.

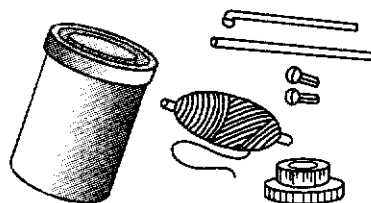


## Rotating Fan

The rotating fan is based on an old traditional toy.

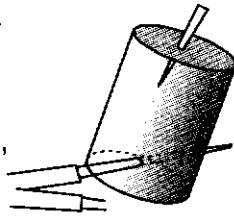
### You will need

- a film-roll case
- a divider
- cycle spoke with 2 nipple nuts
- an injection bottle cap
- string

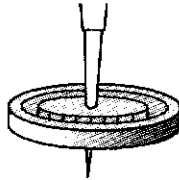


## Here we go

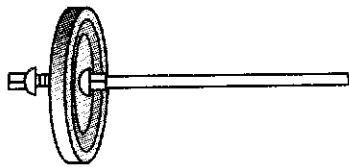
1. First make a 5 mm hole in the base centre of the film-roll case. Make two holes in the cylindrical surface of the case, about 1 cm below its open mouth.



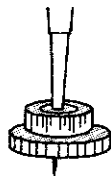
2. Pierce a divider point through the cap centre of the film-roll case.



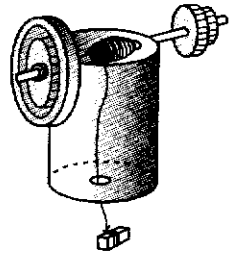
3. Cut a 7 cm long cycle spoke. Fix the case cap to the spoke's threaded end by tightening two nipple nuts.



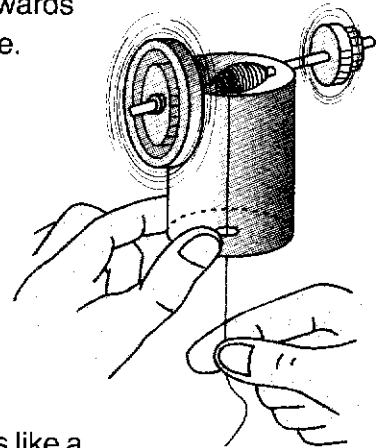
4. Make a hole in the injection-bottle cap by using a divider point.



5. Place the spoke in the case holes and insert the injection-bottle rubber cap. The rubber cap prevents the spoke from coming out of the case. Tie the string to the middle of the cycle spoke. Weave the other end through the base hole of the case. Tie a piece of rubber at the end of the string for a good grip. Now rotate the fan so that the string loops around the spoke.



6. Pull the string downwards and then hold it loose. The fan will spin in one direction and in the process, the string gets rewound on the spoke. On pulling the string again, the fan rotates in the opposite direction.



The rotating cap acts like a flywheel. Because of this stored energy, the fan tends to rotate even after the thread has unwrapped from the spoke. In the process, the string gets rewound on the spoke.

# Loop Glider

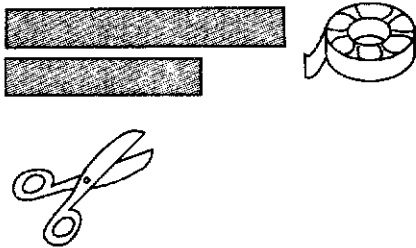
It is amazing that two paper loops fixed at the ends of a straw can glide so elegantly and provide so much fun.

## You will need

- 2 strips of paper
- scissors
- a drinking straw
- cello tape

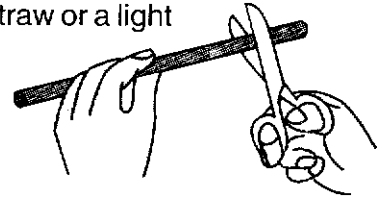
## Here we go

1. Cut two strips of paper, one measuring 2 cm x 16 cm and the other 2 cm x 10 cm.

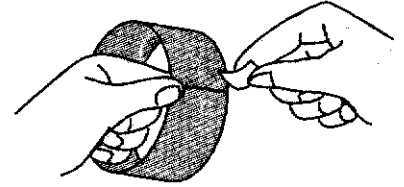


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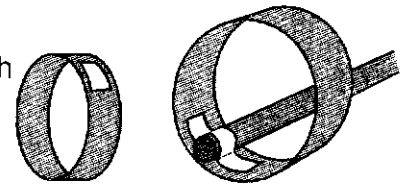
2. Cut a stiff drinking straw or a light reed 15 cm long.



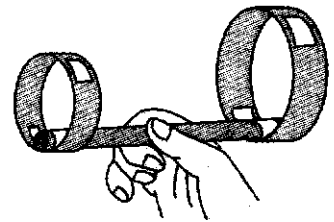
3. Bend the small strip into a loop so that its ends overlap a bit. Tape the overlapping ends together. Do the same with the large strip.



4. With a piece of sticky tape, attach the small loop to one end of the straw.



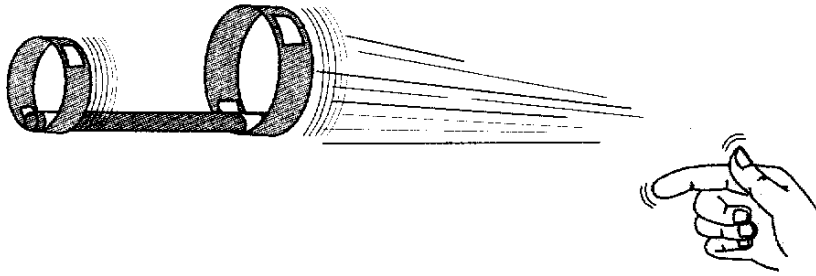
5. Attach the large loop to the other end.



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6. To fly the glider, hold it high with the small loop in the front and throw gently. The loop glider will glide through the air. If the glider wobbles, adjust the position of the loops.

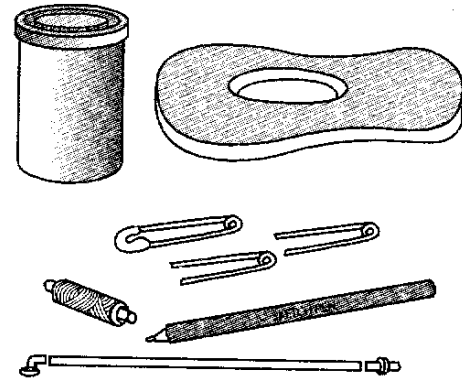


## Circling Airplane

On winding this toy, a small airplane can be made to go round and round in circles. It is based on the principle of conversion of potential energy into kinetic energy.

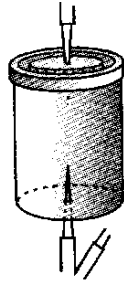
### You will need

- a film-roll case
- cycle spoke with nipple nut
- safety pin
- a sketch pen
- a postcard
- a ballpen refill
- a rubber base
- 25 cm long string
- a small stone

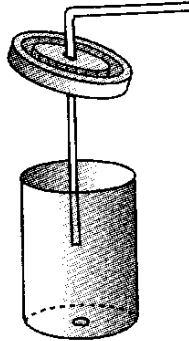


## Here we go

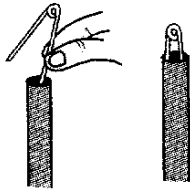
1. Make holes in the middle of the cap and the base of a film-roll case.



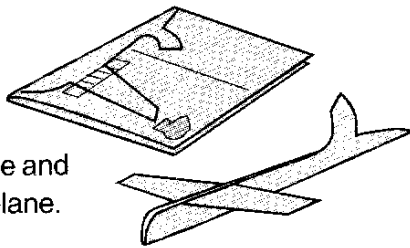
2. Bend a cycle spoke at a right angle. The vertical leg with the threads should be 9 cm long. Once the nipple nut is tightened on the threads, it prevents the spoke from falling through the case. The cap of the case and its base become the bearings for the rotating spoke.



3. Snip the head of a safety pin and insert it in the body of a sketch pen as shown.

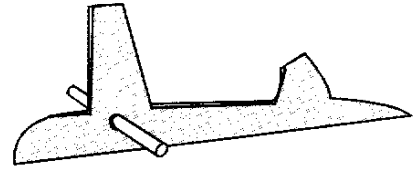


4. Mark out the outline of an airplane on a doubled-up post-card. Cut this outline and shape it into an airplane.

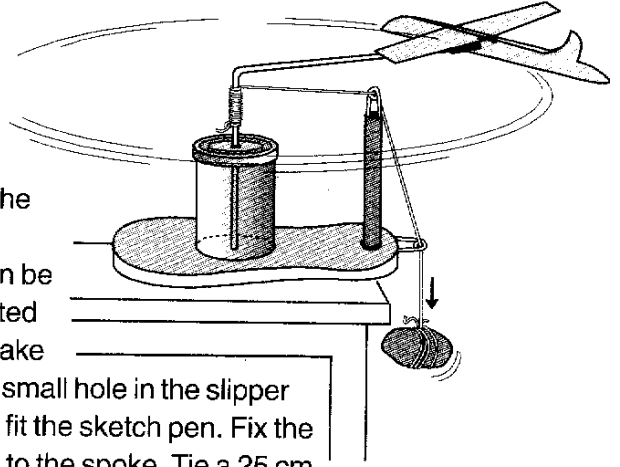


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5. Make a hole in the aircraft's body near the main wing. Stick a 2 cm long refill in this hole with some adhesive.



6. Make a hole in an old rubber slipper so that the film-roll case can be press fitted into it. Make another small hole in the slipper to press fit the sketch pen. Fix the airplane to the spoke. Tie a 25 cm long string to the cycle spoke. Weave it through the eyelets of the two safety pins as shown. Tie a small stone at the other end of the string. On rotating the airplane by hand, the string gets wound on the spoke and the stone is raised up. If the toy is now kept on the table, the stone descends slowly, thus rotating the vertical spoke. This will make the airplane go round and round in circles, to the utter delight of your friends!



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# Pump from the Dump

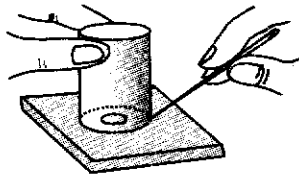
This pump consists of a piston, cylinder and two valves all salvaged from odds and bits. With each up and down movement of the piston, water will leap out in large gushes and delight you no end.

## You will need

- a thick rubber base
- a film-roll case
- nail
- an empty milk bag
- fevicol

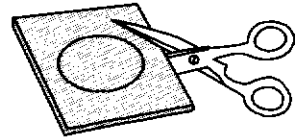
## Here we go

1. Make the *piston* out of a 3 to 5 mm thick rubber slipper sole. Place a film-roll bottle on this rubber and mark out the circle of the piston.

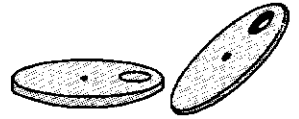


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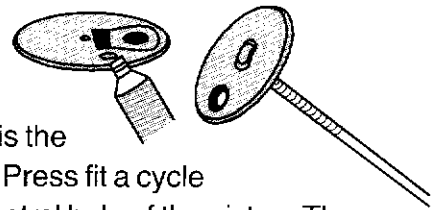
2. Cut it with scissors and then sandpaper its rim on a cement floor until it fits snugly into the film-roll cylinder.



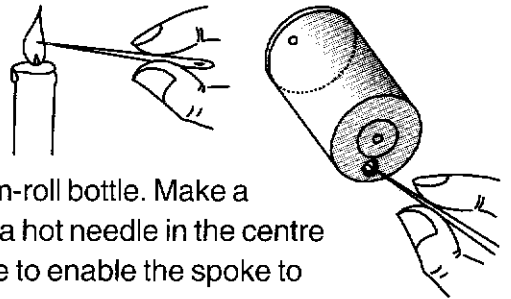
3. Make a hole in the centre of the piston with a nail. Make another hole leaving a margin of 4 mm from the rim. This hole should be 5 mm in diameter.



4. Stick a plastic milk bag flap on one side of this hole. This is the delivery valve. Press fit a cycle spoke in the central hole of the piston. The cycle spoke connecting rod will move the piston up and down.



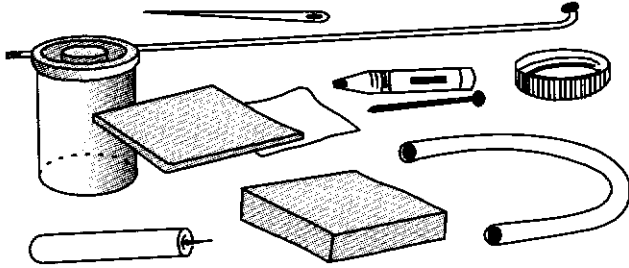
5. Make the *cylinder* out of a plastic film-roll bottle. Make a hole with a hot needle in the centre of its base to enable the spoke to



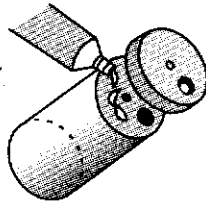
53

pass through. Another 5 mm hole is made in the base near the rim for the water outlet.

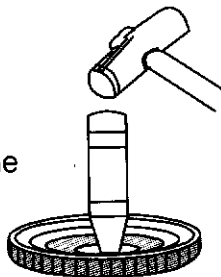
6. Cut a 5 mm thick rubber slipper to fit the circular base of the bottle. A hole is made in its centre to enable the spoke to come out.



7. Make another hole in this 'rubber gasket' corresponding to the water outlet. This rubber gasket stuck on the base of the bottle, acts as a support for the spoke and also prevents leakage.

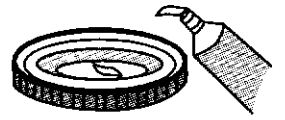


8. Make the *suction valve* by punching a 6 mm hole in the centre of the bottle cap.

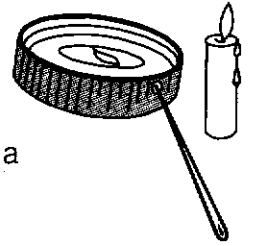


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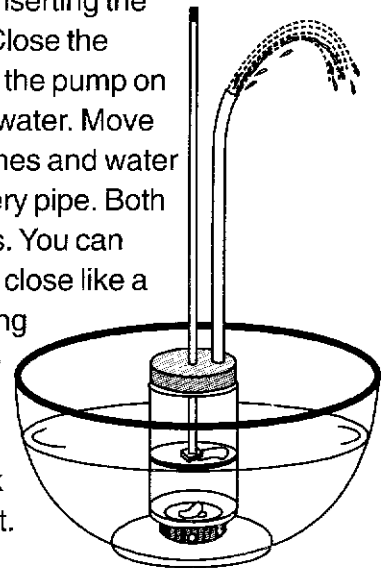
9. Stick a milk bag flap to one side of this hole using fevicol. The milk bag strip acts as a 'flap valve'—opening and closing the hole and letting water flow in only one direction.



10. Place the pump on a base or a pedestal, otherwise its suction valve will get choked. Make 3 holes on the serrated rim of a poster colour bottle cap with a hot needle. The cap makes a sturdy base for the pump.



11. Assemble the pump by inserting the piston into the cylinder. Close the suction valve cap. Stand the pump on its base in a reservoir of water. Move the cycle spoke a few times and water will gush out of the delivery pipe. Both the valves open upwards. You can see the valves open and close like a fish's mouth. This working model of an actual pump does not have a handle like a real hand pump. You'll have to rack your brains to figure it out.



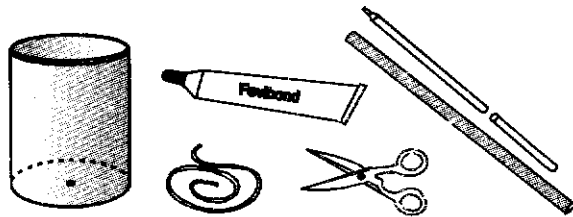
55

# Cranky Doll

As you rotate the handle of this little machine, the doll on top jumps up and down.

## You will need

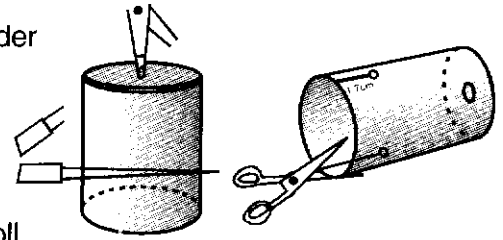
- a film-roll case
- a divider
- a thick straw
- a thin wire
- an old card
- a ballpen refill



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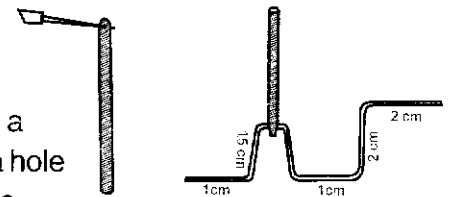
## Here we go

1. Using a divider point, make two holes in the cylindrical surface of the film-roll



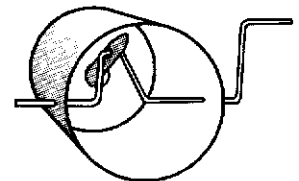
case, at a distance of 1.7 cm from the open end. Make an 8 mm wide hole at the centre of the bottle base. Use scissors to make straight cuts from the mouth of the case to the holes.

2. Take a thick straw of length 5 cm and, with a divider, make a hole at one end. Also



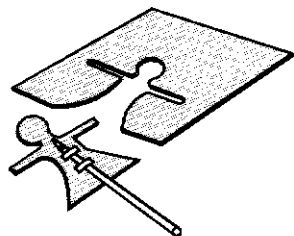
bevel cut the corners of this end. Take a thin wire of length 12 cm and bend it like a U-shaped crank and handle as shown.

3. Slip the straw in the crank. Gently slip the wire crank through the cuts in the holes by pressing the mouth of the case. The straw will come out of the base hole of the case.

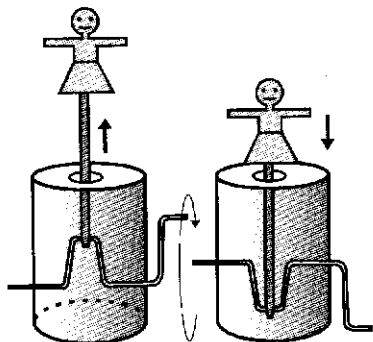


57

4. Cut the outline of a doll from a card sheet. Affix a small ballpen refill to the doll. Slip this refill into the straw.



5. Now, as you rotate the handle, the U-shaped crank moves in a circle, making the straw move up and down. The doll, which is attached to the straw, also jumps up and down. (The pistons of a car's engine also move up and down like this inside the cylinder. This makes the crankshaft go round and round.) In our small machine, the rotary motion of the handle gets converted into the straight-line motion of the straw.



## Magic Windmill

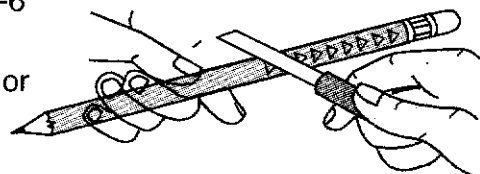
This windmill is essentially a propeller on a notched stick. Its working has puzzled and baffled people for over a century.

### You will need

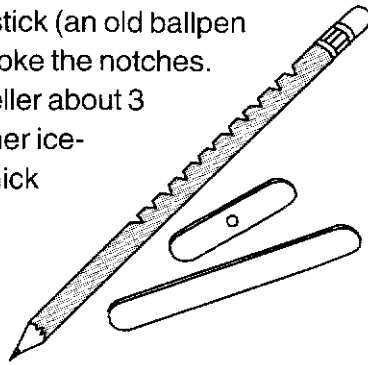
- a 25 cm long reed stick, pen or pencil
- a file or a knife
- ice-cream sticks
- pin or nails
- a ballpen refill

### Here we go

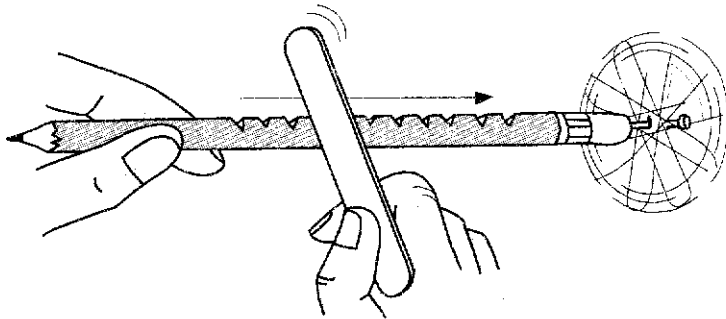
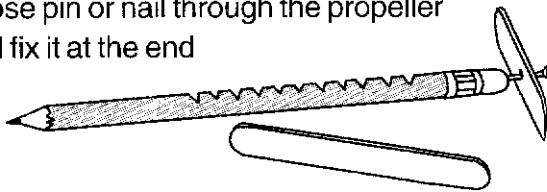
1. Take a 25 cm long reed stick, even a used sketch pen or a pencil with a rubber on one end will do. Cut 5-6 notches on it using a knife or a triangular file.



2. Use an ice-cream stick (an old ballpen refill is better) to stroke the notches. Make a small propeller about 3 cm long from another ice-cream stick (or a thick card sheet).



3. Put a loose pin or nail through the propeller hole and fix it at the end of the notched stick.



4. Holding your forefinger on the far side of the notched stick and your thumb on the near side, stroke the ice-cream stick back and forth on the

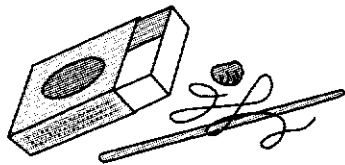
notches. The propeller will turn in one direction. Now loosen your forefinger and let your thumb press against the stick, stroking the stick back and forth all the while. The propeller will now turn in the opposite direction. The horizontal and vertical vibrations of the notched stick are not the same frequency and amplitude. The resulting vibrating motion of the stick (and thus of the pin) is elliptical. Depending on the finger pressure and the side which is rubbed, these elliptical vibrations can be clockwise or anticlockwise. The friction between the pin and the propeller sets the propeller in motion.

# Matchbox Drum

This sound toy is easy to make.

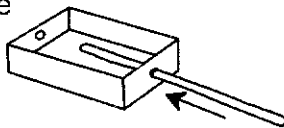
## You will need

- an empty matchbox
- a piece of string
- a bamboo stick
- a small stone



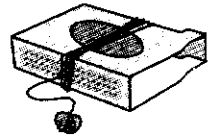
## Here we go

1. Make a hole on each of the two ends of a matchbox. Fix a stick vertically as shown.

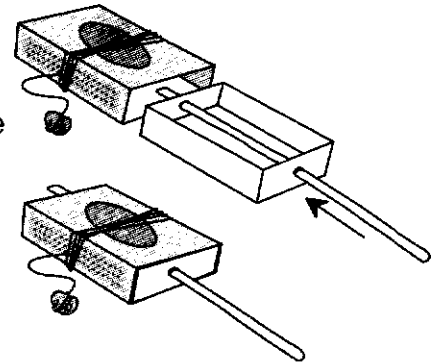


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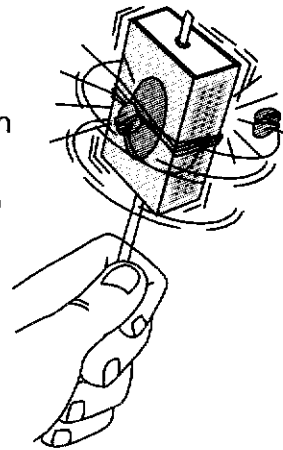
2. Tie one end of the thread around the box to fix the sticks. Tie a stone at the other end.



3. Adjust the string length so that the stone strikes the broad surface of the matchbox.



4. Hold the matchbox in your hand and twist to produce rhythmic sounds.



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# Windmill

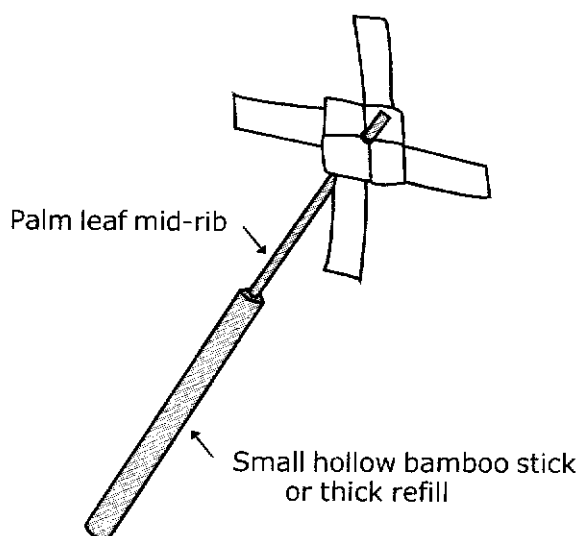
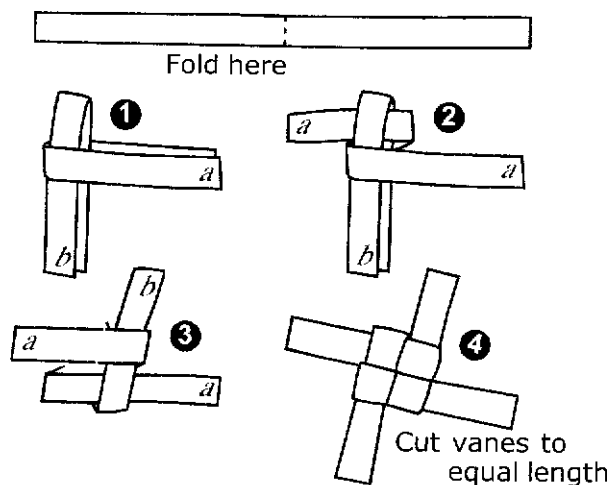
To have fun with your windmill toy all you really need is the wind!

## You will need

- 2 strips of palm leaves (20 cm x 2 cm)
- a palm leaf rib or a stick
- a hollow bamboo stick or a ballpen refill

## Here we go

Take two strips of a palm leaf, each about 20 cm long and 2 cm wide. Follow the steps to complete the windmill.



# Screecher

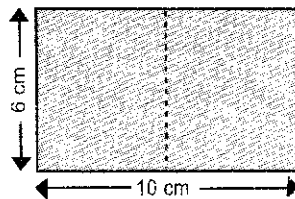
Children through the ages have enjoyed playing with screechers. A screecher is a very simple but loud toy.

## You will need

- a piece of paper (6 cm x 10 cm)
- scissors

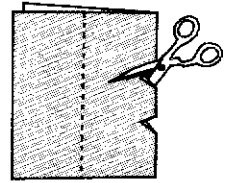
## Here we go

1. Bring the shorter edges of the paper together and fold in the middle.

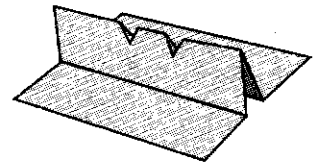


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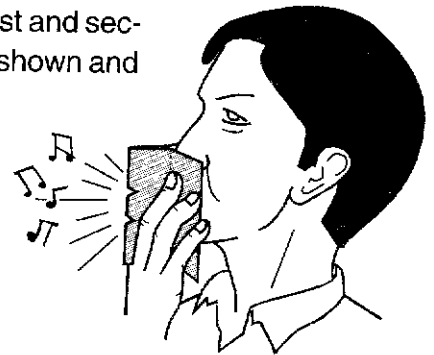
2. Cut two tiny V shaped pieces from the folded edge. And fold the left edge to the right. Do the same behind.



3. Now let the two side pieces stand out from the middle section.



4. Hold the paper vertically between the first and second fingers as shown and bring it to your lips. Blow hard and it will produce a piercing screech.



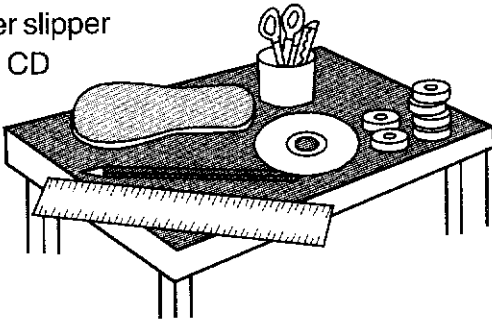
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# Magnetic Levitating Pencil

You can while away hours playing with this terrific toy. It also demonstrates magnetic levitation.

## You will need

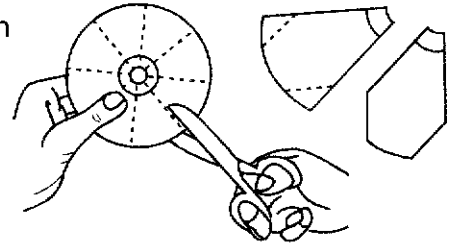
- 6 ring magnets (17.5 mm OD, 7.5 mm ID, 3 mm thick)
- an old rubber slipper
- a discarded CD
- a pencil
- few simple hand tools



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## Here we go

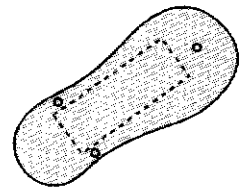
1. First mark out 8 equal sectors in the discarded CD. Cut one sector using a pair of large scissors. Cut the lower corners at an angle.



2. Take two ring magnets and press fit them in a pencil. They are just right to fit into a pencil though you might have to scrape the pencil a bit. The polarities of the magnets do not matter.

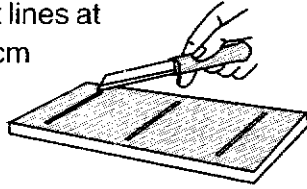


3. Cut a rectangle, 15 cm x 7.5 cm, from an old rubber slipper.

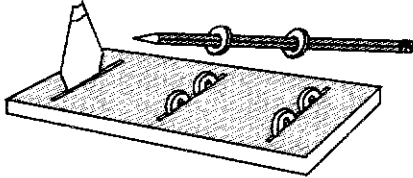


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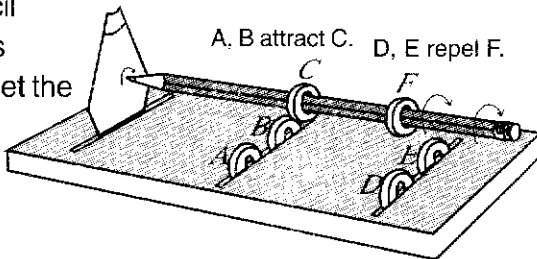
4. From one end, mark out lines at 2 cm, 6.5 cm and 12.5 cm on this rubber base. Make 5 cm wide cuts on these lines.



5. Now insert the CD piece into the first cut. Place 2 ring magnets in the cut next to the CD. These magnets must have poles which attract the pencil magnet close to the writing end. Insert two more ring magnets in the other slit. These magnets must repel the pencil magnet away from the writing end.



6. If you now place the pencil on the rubber base, it will levitate in the air with its tip resting on the CD. Now twirl the rear end of the pencil and it will keep spinning for a long time. You may have to adjust the positions of the pencil magnets a bit to get the pencil to levitate.



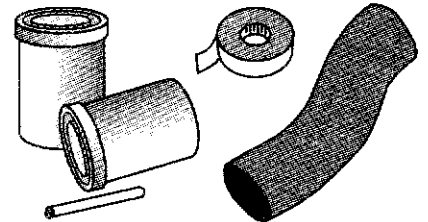
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## Balloon Pump

With this simple pump you can actually inflate a balloon and make it POP!

### You will need

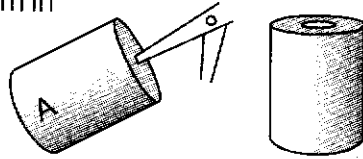
- two film-roll cases
- 22 cm of old cycle tube
- a refill or a stiff straw
- cellotape
- scissors



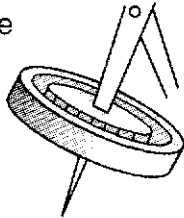
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## Here we go

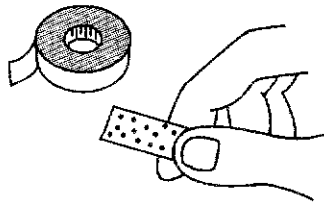
1. Make a hole in the base of film-roll case A by using a divider point. Widen this hole by gently rotating the pointed end of a scissors. The hole should be about 1 cm in diameter and should not have any burrs.



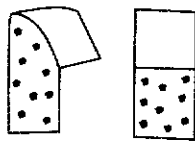
2. Make a similar hole in another cap.



3. Take 3 cm of sticky tape. The dots show the 'sticky' side.

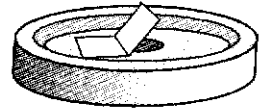


4. Fold 1 cm of the sticky part on itself. The lower 1 cm would still be sticky. Prepare two such tapes.

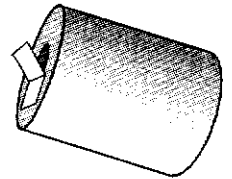


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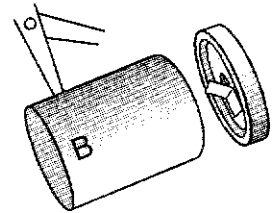
5. Stick the glue part of one tape to the cap. The tape will act like a hinge. It will open and close like a valve. This will be the delivery valve.



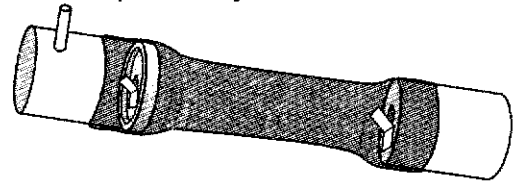
6. Paste the other tape on the base of the film-roll case A. This will be the suction valve.



7. Take film-roll case B and make a small hole on its cylindrical surface. Press fit a short stiff straw in it for the delivery pipe. Fix the cap with the delivery valve to the other bottle.



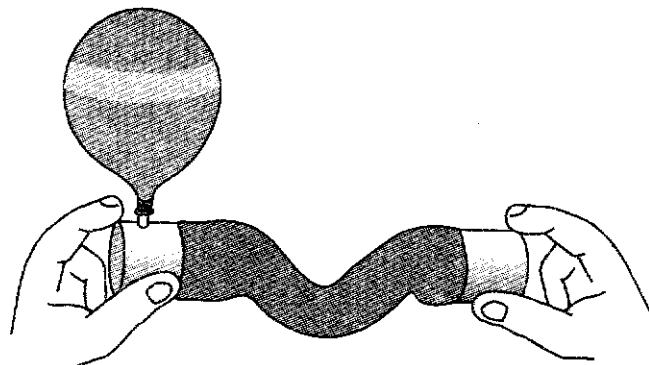
8. Cut a 22 cm long piece from an old bicycle tube. Stretch and slide the tube over both the bottles. Bottle B will go lid down, while bottle A will go bottom-up in the cycle tube. The bottles will be



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separated by 15 cm of cycle tube. This rubber tube acts like a pair of bellows.

9. Now hold a medium-sized balloon in the delivery pipe. Fix it to the pipe with a rubber band to prevent any air leak. On repeatedly pumping the cycle tube by holding the two bottles, the balloon will inflate. You can 'POP' a balloon with this simple pump.



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## Spinning Bottle

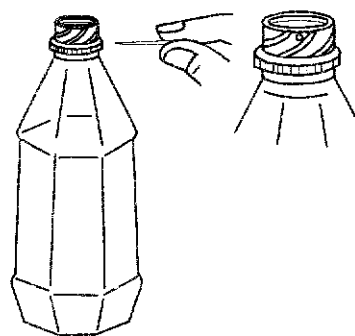
This simple experiment demonstrates Newton's third law of motion—that every action has an equal and opposite reaction.

### You will need

- a 500 ml plastic water bottle
- a needle
- some thread
- a nail
- plastic straw
- some clay, m-seal or adhesive

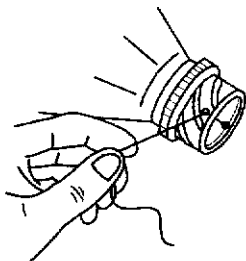
### Here we go

1. Take a 500 ml plastic water bottle. With a big needle, make a through hole near the threaded end.

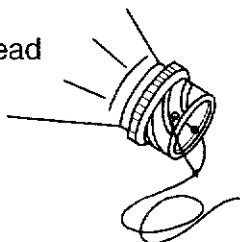


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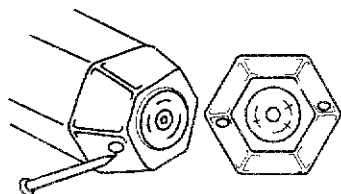
2. Weave a 8 cm thread through this hole and tie a knot to make a loop.



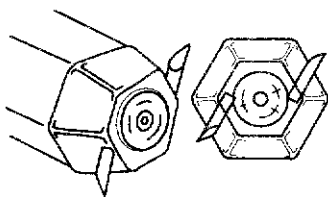
3. Tie a long thread to this loop.



4. With a big nail, make a hole on the vertical wall of the bottle near its base. Make another hole at the other end.

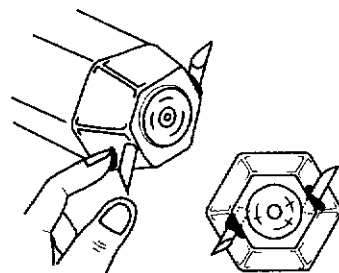


5. Take two pieces of 3 cms long stiff plastic straw (old gel pen refills are ideal). Cut one end of these pieces at a slant. Press them in the holes in the orientation shown.

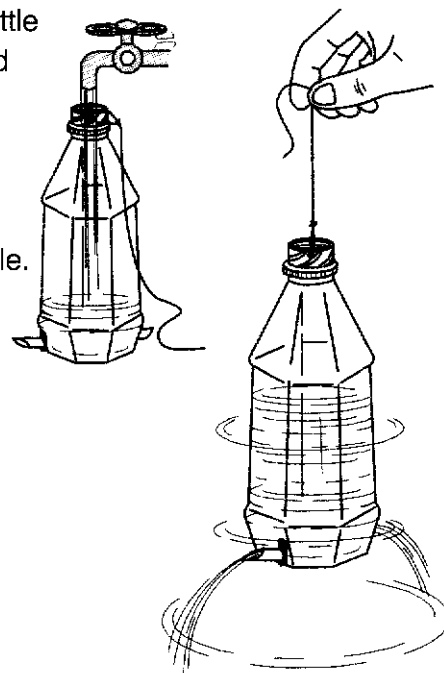


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6. Apply M-seal or some other adhesive (kneaded wheat flour does well too) to prevent leakage.



7. Now fill the bottle with water and hang it by the thread. Two water jets will gush out and rotate the bottle.



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# Paper Clapper

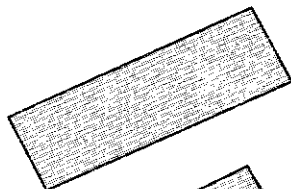
A paper clapper is simple to make and great fun to play with. All you really need is a piece of paper and a little time.

## You will need

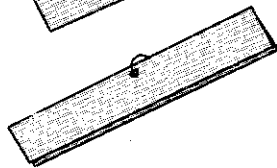
- an A4 size paper

## Here we go

1. Take an old A-4 size paper and cut it in half along the length.

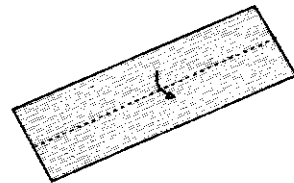


2. Fold it in half.

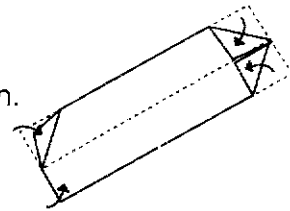


*Note: I first saw this paper clapper with Dr. Anil Awchat of Pune.*

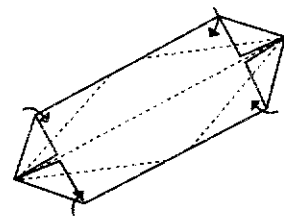
3. Open it again.



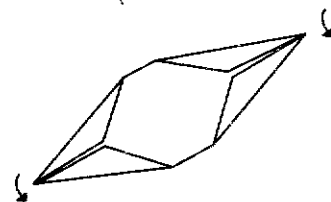
4. Fold all the four corners as shown.



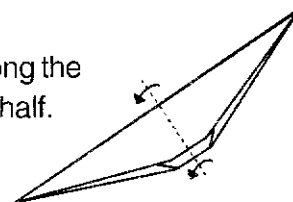
5. Once again fold inwards along the 4 slanting dotted lines.



6. You will get this shape. Fold this shape in half.

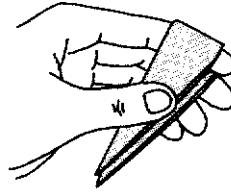


7. Again fold along the dotted line in half.

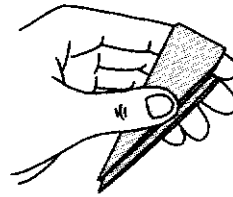




8. Fold it on your finger so that the fold is a bit rounded.



9. Make a crease at right angles on the rounded fold. This crease will act like a spring.



10. Now hold the clapper with your thumb and index finger as shown. On pressing and releasing your thumb and finger, the clapper hands will clap.

